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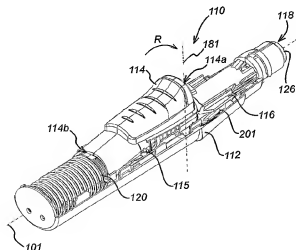
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[Continued on next page]

(54) Title: INJECTION DEVICE



(57) Abstract: An injection device (110) comprises a housing (112) adapted to receive a syringe (122) having a discharge nozzle (122), an actuator (114) and a drive (120) acted upon by the actuator which acts upon the syringe to advance it from a retracted position in which the discharge nozzle is contained within the housing to an extended position in which the discharge nozzle extends from the housing. There is a locking mechanism (HS) in communication with the actuator and activatable to be moved from a locked position in which the actuator is prevented from releasing the drive to an unlocked position in which the actuator is operable to act upon the drive to advance the syringe. The locking mechanism or the housing includes integrally formed biasing means (210) adapted to return the locking mechanism to a locked position when it is not activated. There is no need for separate springs to be used to bias the releasable locking mechanism out of the housing.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**INJECTION DEVICE****5 FIELD OF THE INVENTION**

The present invention relates to an injection device of the type that receives a syringe, extends it, discharges its contents and then retracts it automatically.

10

**BACKGROUND OF THE INVENTION**

- Known injection devices are shown in WO 95/35126 and EP-A-0 516 473 and tend to employ a drive spring and some form of release mechanism that releases the syringe from the influence of the drive spring once its contents are supposed to have been discharged, to allow it to be retracted by a return spring.

It is known to provide a safety interlock around the needle of such injection devices.

- 20 Such a safety interlock prevents accidental activation of a trigger of the injection device by preventing rotation of the trigger. The interlock is sprung loaded out of the aperture through which the syringe extends once activated. The interlock is disengaged by pressing it in towards the aperture by, for example, pressing it against a user's body, thereby allowing the trigger to be activated and the syringe to be  
25 extended.

- The interlock has to be biased out of the aperture so that it can be activated. Known devices use small coil springs positioned between the housing of the injection device and the interlock. These small springs are costly to assemble and introduce a risk that  
30 they may be missed out all together during the manufacturing process.

## SUMMARY OF THE INVENTION

The injection device of the present invention is designed to deal with the  
5   aforementioned problems.

In view of the foregoing, there is provided, in a first aspect of the present invention,  
an injection device comprising:

- a housing adapted to receive a syringe having a discharge nozzle;
- 10   an actuator;
- a drive acted upon by the actuator and in turn acting on the syringe to advance  
it from a retracted position in which the discharge nozzle is contained within the  
housing to an extended position in which the discharge nozzle extends from the  
housing;
- 15   a locking mechanism in communication with the actuator and activatable to be  
moved from a locked position in which the actuator is prevented from releasing the  
drive to an unlocked position in which the actuator is operable to act upon the drive to  
advance the syringe;
- characterised in that the locking mechanism or the housing includes integrally  
20   formed biasing means adapted to return the locking mechanism to a locked position  
when it is not activated.

Hence, there is no need to provide small springs to bias the locking mechanism into  
its locked position. This reduces the cost and complexity of assembly of the injection  
25   device.

In one embodiment of the present invention, the locking mechanism includes the  
integrally formed biasing means.

- 30   Preferably, the biasing means comprises at least one resilient arm integrally formed  
with the locking mechanism.

The locking mechanism can be arranged in the housing such that the resilient arm is  
biased against a surface of the housing on activation.

Generally, the locking mechanism is arranged in the housing such that it extends from the housing when it is in its unlocked position and slides into the housing on activation.

In one embodiment of the present invention, the internal surface of the housing comprises a cam against which the resilient arm is biased on activation such that the spring force in the resilient arm increases according to the distance by which the locking mechanism is slid into the housing from its unlocked position.

The cam provides a mechanical advantage so that the arms can be designed for a higher spring rate with shorter travel than that necessarily required to disengage the locking mechanism.

Preferably, the locking mechanism comprises a plurality of resilient arms, wherein the housing includes a corresponding cam surface on the internal surface of the housing against which each resilient arm is biased on activation. Most preferably, the locking mechanism comprises two arms.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of an injection device according to the present invention without an upper section of its housing;

Figure 2 shows a top-side view of the injection device shown in figure 1;

Figure 3 shows an expanded perspective view of the housing and releasable locking mechanism of the injection device of the present invention; and

Figure 4 shows an alternative expanded perspective view of the housing and releasable locking mechanism of the injection device of the present invention.

## 5 DETAILED DESCRIPTION OF THE DRAWINGS

Figures 1 and 2 show an injection device 110 according to a first embodiment of the present invention. The injection device 110 has an injection device housing 112 and a longitudinal axis 101.

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A syringe (not shown) is contained in the housing 112. The injection device 110 comprises trigger 114 (actuator) and a releasable locking mechanism 116. The trigger 114 has a first end 114a and a second end 114b. The trigger 114 is rotatable about a pivot 115 from a rest position (as shown in Figure 2) to an active position. The second end 114b of the trigger 114 connects with a drive coupling 121 which is acted upon by a drive spring 120. The drive coupling 121 is in communication with the syringe 122.

15

Rotation of the trigger 114 about the pivot 115 in a direction R (i.e. downwards into the housing 112 at its first end 114a) causes the second end 114b of the trigger 114 to disengage from the drive coupling 121, thereby letting the drive spring 120 drive the syringe 122 (via the drive coupling 121) along the longitudinal axis 101 and out of an aperture 118 in the housing 112.

20

The releasable locking mechanism 116 is in communication with sliding sleeve 126 which protrudes, when in a first position, from the aperture 118 in the housing 112. The locking mechanism 116 is deactivated by movement of the sliding sleeve 126 along the longitudinal axis 101 into the housing 112 into a second position.

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A first end 126a of the sliding sleeve 126 can be placed against a body into which drug is being delivered, thereby deactivating the releasable locking mechanism 116 and allowing the trigger 114 to rotate in direction R from its rest position to its active position.

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The trigger 114 is provided at its first end 114a with a first portion 150 having a cut-out 152. The first portion 150 extends from the first end 114a of the trigger 114a in a direction substantially parallel to the longitudinal axis 101.

- 5 The releasable locking mechanism 116 includes a protrusion 154 which projects in a direction along a perpendicular axis 181 which is perpendicular to the longitudinal axis 101. The cut-out 152 is dimensioned to receive the protrusion.

When the releasable locking mechanism 116 is in its first position, an end of the  
10 protrusion abuts an under-surface of the first portion 150, thereby preventing rotation of the trigger 114.

When the releasable locking mechanism 116 is in its second position (not shown) following movement of the sliding sleeve 126 into the housing 112, the cut-out 152 is  
15 positioned above the end of the protrusion 154 allowing it to pass over the protrusion 154 when a downwards force is applied the trigger 112. Hence, the trigger 112 is no longer prevented from rotating and disengages itself from the drive coupling 121, thereby extending the syringe 122.

20 As can be seen in figures 3 and 4, the releasable locking mechanism 116 is provided with a pair of integrally formed resilient arms 201. The resilient arms 201 flex resiliently in a direction away and towards the releasable locking mechanism 116.

The housing 112 comprises a pair of camming surfaces 210 which are positioned in  
25 line with the resilient arms 201 towards the end of the point in the housing 112 at which the locking mechanism 116 is disengaged.

The resilient arms 201 communicate with the camming surfaces 210 such that, as the sleeve 126 is pressed into the housing 112, the arms 201 bias the releasable locking  
30 mechanism 116 and sleeve 126 out of the opening 126. In this way, when no force is applied to the end 126a of the sleeve, the releasable locking mechanism 116 remains engaged preventing actuation of the trigger.

It will be appreciated that any configuration of integrally-formed resilient biasing may be used in place of the arms 201.

5 The present invention provides the significant advantage that the biasing of the releasable locking mechanism 116 is integral with the mechanism itself, thereby obviating the need for small springs which are complex and costly to assemble. Alternatively, the skilled person will appreciate that the resilient arms 201 could be mounted on the housing 112 and communicate with a surface of the releasable locking mechanism 116.

10 It will of course be understood that the present invention has been described above purely by way of example and modifications of detail can be made within the scope of the invention.



**CLAIMS**

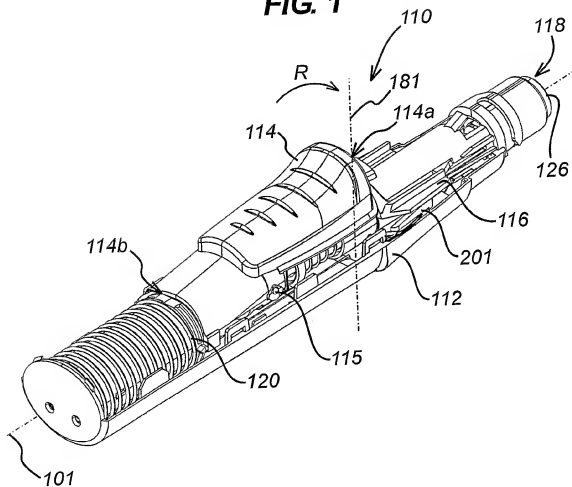
1. An injection device comprising:
  - a housing adapted to receive a syringe having a discharge nozzle;
  - 5 an actuator;
  - a drive acted upon by the actuator and in turn acting on the syringe to advance it from a retracted position in which the discharge nozzle is contained within the housing to an extended position in which the discharge nozzle extends from the housing;
  - 10 a locking mechanism in communication with the actuator and activatable to be moved from a locked position in which the actuator is prevented from releasing the drive to an unlocked position in which the actuator is operable to act upon the drive to advance the syringe;
  - characterised in that the locking mechanism or the housing includes integrally
  - 15 formed biasing means adapted to return the locking mechanism to a locked position when it is not activated.
2. The injection device of claim 1, wherein the locking mechanism includes the integrally formed biasing means.
- 20 3. The injection device of claim 2, wherein the biasing means comprises at least one resilient arm integrally formed with the locking mechanism.
4. The injection device of claim 3, wherein the locking mechanism is arranged in
- 25 the housing such that the resilient arm is biased against a surface of the housing on activation.
5. The injection device of claim 4, wherein the locking mechanism is arranged in the housing such that it extends from the housing when it is in its unlocked position
- 30 and slides into the housing on activation.
6. The injection device of claim 5, wherein the internal surface of the housing comprises a cam against which the resilient arm is biased on activation such that the

spring force in the resilient arm increases according to the distance by which the locking mechanism is slid into the housing from its unlocked position.

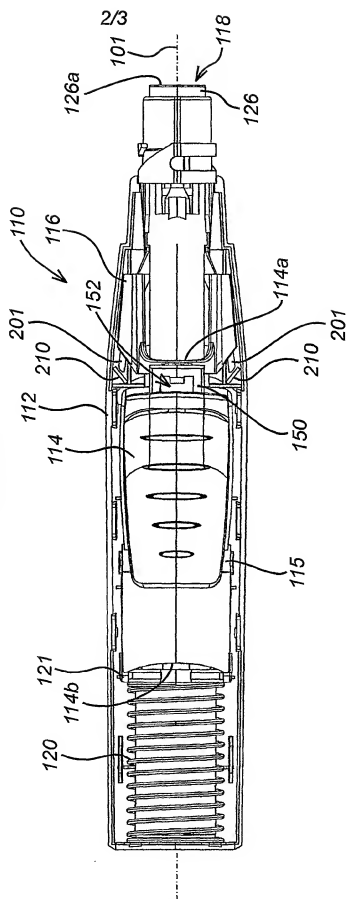
7. The injection device of claim 6, wherein the locking mechanism comprises a plurality of resilient arms, wherein the housing includes a corresponding cam surface on the internal surface of the housing against which each resilient arm is biased on activation.

8. The injection device, substantially as hereinbefore described with reference to the accompanying drawings.

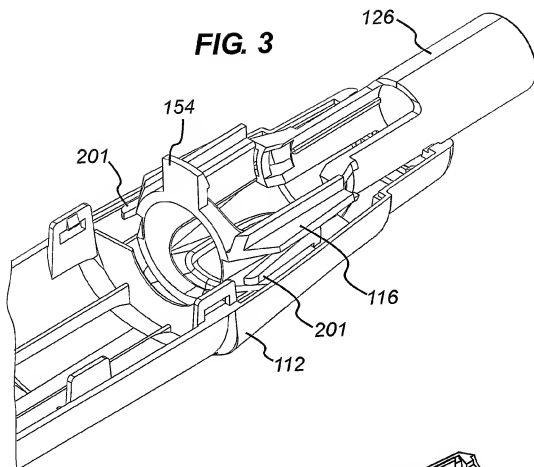
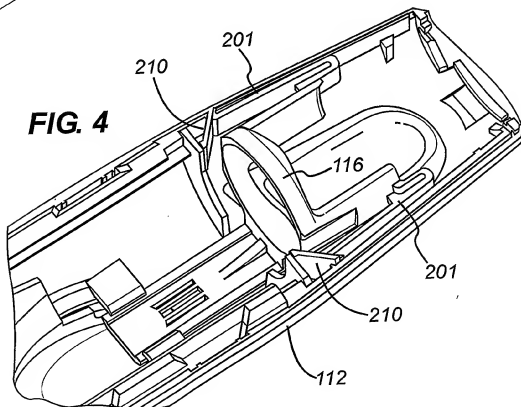
1/3

**FIG. 1**

**FIG. 2**



3/3

**FIG. 3****FIG. 4**

## INTERNATIONAL SEARCH REPORT

 International application No  
 PCT/GB2006/001030

 A. CLASSIFICATION OF SUBJECT MATTER  
 INV. A61M5/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 194 505 A (SCHMITZ, WILLIAM L) 25 March 1980 (1980-03-25) column 3, line 49 - column 4, line 12; figures 2,3,8	1,2
Y	figure 3	3-7
Y	US 4 378 015 A (WARDLAW ET AL) 29 March 1983 (1983-03-29) abstract; figures 1,4	1-7
Y	US 2003/105430 A1 (LAVI GILAD ET AL) 5 June 2003 (2003-06-05) column 10, paragraphs 165,166; figures 49-55	1-7
A	US 6 575 939 B1 (BRUNEL MARC) 10 June 2003 (2003-06-10) abstract; figures	1

-/-



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

23 May 2006

Date of mailing of the international search report

02/06/2006

Name and mailing address of the ISA/

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Ehrensam, F

## INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2006/001030

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 176 643 A (KRAMER ET AL) 5 January 1993 (1993-01-05) abstract; figures	1-7
Y	US 5 540 709 A (RAMEL ET AL) 30 July 1996 (1996-07-30) abstract; figures 7,8	1-7

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 8

Claim 8 is lacking clarity since it relates to the drawings and therefore no meaningful search could be executed

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.



# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/682006/001030

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☒ Claims Nos.: 8  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2006/001030

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4194505	A	25-03-1980	NONE
US 4378015	A	29-03-1983	NONE
US 2003105430	A1	05-06-2003	NONE
US 6575939	B1	10-06-2003	AT 227593 T 15-11-2002 AU 1767999 A 23-08-1999 DE 69809471 D1 19-12-2002 DE 69809471 T2 02-10-2003 EP 1053037 A1 22-11-2000 ES 2188036 T3 16-06-2003 FR 2774294 A1 06-08-1999 WO 9939759 A1 12-08-1999
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US 5540709	A	30-07-1996	NONE